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EP 0068539 A US 4764803 A US 4755661 A

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UK CL (Edition J) B6A AK
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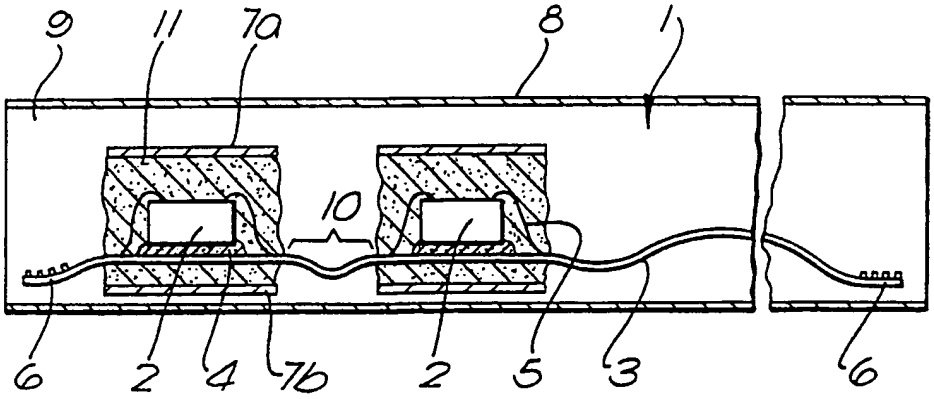
# (54) Portable electronic token

(57) In order to allow a thin portable token of the Smart Card type to be flexible, yet protect the electronic components (2) within it, the token is manufactured from a resin material and includes high tensile foil inserts (7a, 7b) above and below the component - producing a double skinned effect to stiffen and strengthen the token in the region of the component. The components are mounted on a substrate (3), which also acts as a hinge between components to enable flexing of the token as a whole. As an alternative, frames (15) (Fig. 2) encircling each component (2) or moulded resin members (11) (Fig. 3) encapsulating the components (2), may be used.

FIG. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy

FIG. 1

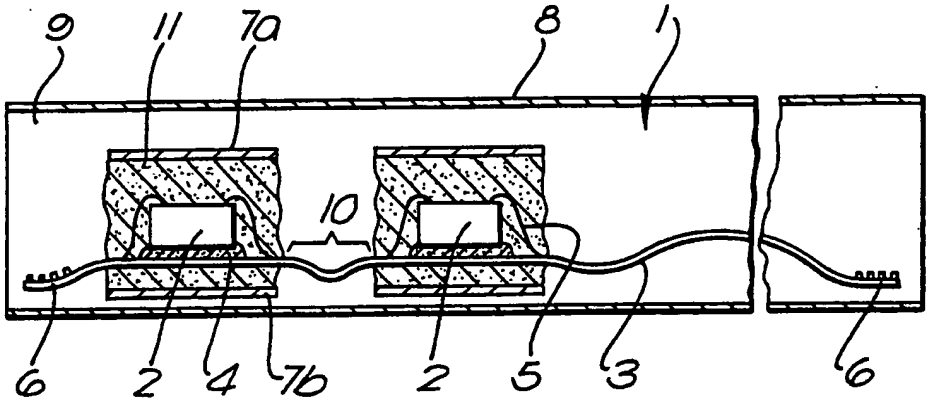



FIG. 2

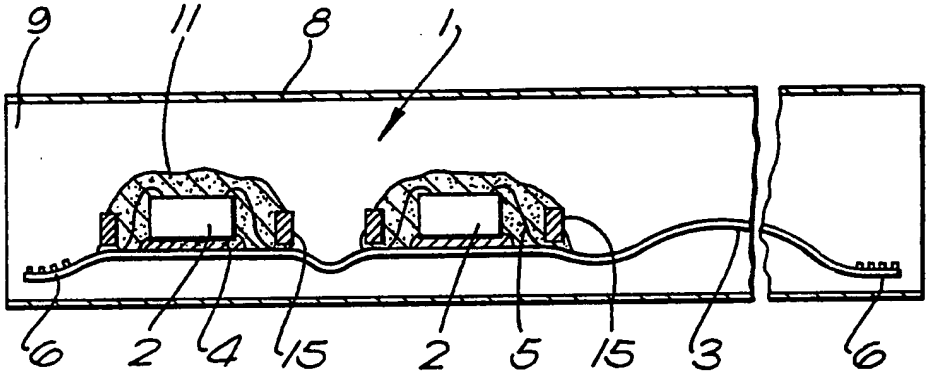
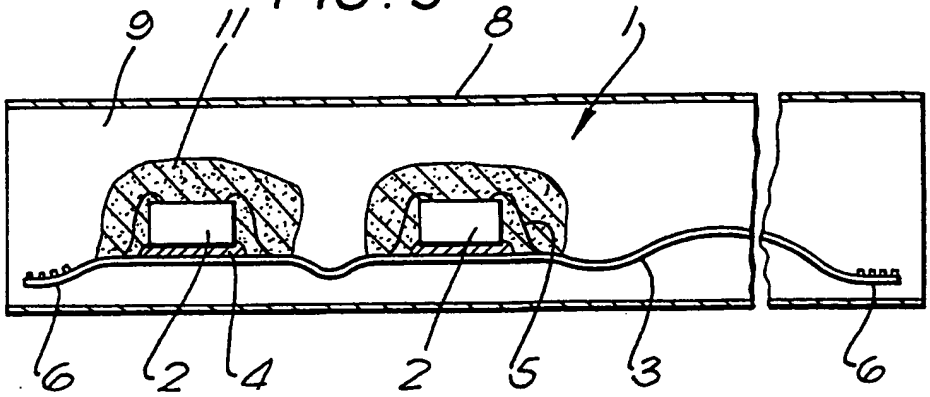



FIG. 3



# PORTABLE ELECTRONIC TOKEN

This invention relates to a portable electronic token and in particular it relates to a portable token of credit card sized dimensions and containing electronic circuits for data storage and processing. Such a token is commonly termed a "Smart Card" or "integrated circuit card".

A Smart Card generally comprises one or more components such as integrated circuits mounted on a substrate and encapsulated within a plastics material or laminate of credit card sized dimensions, typically 8.5 x 5.4 x 0.075 cms. It is important that such cards are flexible so that they can be placed in the users pocket, wallet or purse and be capable of withstanding bending forces. Furthermore is a card is to be compatible with present day systems it must include a magnetic strip and meet with the flexing requirements imposed upon cards to be used in cash dispensing machines, which are governed by ISO standards.

It has been previously proposed to provide a contact-type smart card structure which protects the components, either by mounting them on a metal foil and encapsulating them in a hard resin as described in

EP0068539A, or by providing a box-like structure of a plastics material within the token which encloses the components as described in US 4755661.

The present invention seeks to provide an alternative structure which is particularly applicable to contactless smart cards.

According to the present invention there is provided a portable electronic token comprising a plurality of discrete components encapsulated in a plastics material and at least one respective high tensile member associated with each component and disposed such that a region of the token encompassing the component is substantially constrained from flexing, the components being mounted on a flexible substrate which extends between the components so as to form resilient hinge portions between adjacent components.

In a particularly preferred embodiment, the token comprises a pair of face members defining opposite surfaces of the token and the flexible substrate is disposed between said members. The token is typically a "contactless" Smart Card, that is information is passed to and from the card by inductive coupling such that no direct electrical contact is needed between the components and the surface members.

The face members of, for example, polycarbonate act as strengthening skins and may also act as labels for the token.

In one preferred embodiment two high tensile members are provided which are associated with each component, in which case one may be provided above the component and a complementary one below the component, where above and below are terms denoting the relative position of the member with respect to the substrate. The second member may be integral with the substrate or may be an extra component.

The high tensile members are advantageously made of a metal foil such as nickel, stainless steel or high tensile steel.

In an alternative embodiment of the invention, the high tensile member substantially encircles the component and is conveniently in the form of a circular or square plate having an aperture therein into which the component projects.

In any of the embodiment described above, the reinforcing effect of the high tensile member or members can

be supplemented by providing a hard resin around the component. However, in a yet further embodiment of the invention, the resin can constitute the or each high tensile member, the resin being moulded directly onto the component.

The present invention will now be described, by way of example with reference to the accompanying drawings, in which Figures 1, 2 and 3 show diagrammatic side views of alternative embodiments of the present invention.

Referring now to the drawings, Figure 1 shows a portable token 1 of credit card sized dimensions. The card comprises a plurality of electronic components 2 such as integrated circuits. The circuits will generally include microprocessing and memory functions and are mounted upon a flexible substrate 3 which may be a polyimide or polyester. The components 2 are mounted upon the substrate by a bonding material 4 and connected by further bonds 5 to electronic interconnections on the substrate (not shown). The card shown is one of the contactless coupling type and includes an inductive loop 6 mounted towards its periphery, for receiving power and transmitting and receiving data signals.

Complementary pairs of foils 7a and 7b are provided above and below components 2. These foils are made of a

material such as nickel or stainless steel but can be of any material provided it has good tensile properties. The region between the foils is filled with a hard glob top resin material 11 such as an epoxy resin or a silicon resin which reduces shear between the foils, is ionically clean and thermally conductive. One or more labels 8 may be provided on the surfaces of the card. The labels may be of polycarbonate and can be skins which, together with the plastics material between them serve to produce a strong but flexible card. The card is manufactured either by a lamination process as is well known in the art or by means of an injection moulding process in which a suitable fluid plastics material is applied to a mould which already contains the components, substrate and labels and then allowed to harden.

It is thus seen that the structure of the card around each component and, if the labels are of suitable material, of the card as a whole is equivalent to that of a double skinned hull commonly used in boat building and in aircraft structures. The combination of the foils 7a and 7b and resin material between them act to stiffen and strengthen the card around the region of each component and thus prevent this region from flexing, which could be potentially disastrous to the circuits or electrical connections.

Flexing is however allowed of those portions of the card not surrounding the components, such as the region 10 in the figure. The portion of the substrate 3 in this region accordingly acts as a hinge when the card flexes. Thus a card embodying the invention can be manufactured, which card is flexible enough to withstand bending when carried by a user, or in operation, but protects, and holds rigid the region surrounding, each component.

The embodiment shown in Figure 2 includes the same reference numerals as used in Figure 1 for like parts and differs in that the pair of foils 7a, 7b is replaced by a frame 15 made of high tensile steel which encircle the component 2 and are attached to the substrate 3 by glob top resin 11 which also extends over the component 2 to assist in protection. The frame 15 can be square, circular or any other suitable shape although circular is preferred as there are no sharp corners which might puncture the skin and label 8.

The further embodiment shown in Figure 3 differs from those shown in Figures 1 and 2 in that the glob top resin 11 is moulded to form a strengthening member without the need for metal foils or frames. The resin 11 is moulded directly onto the component and substrate and so is easily

reproducible.

The constructions described herein are particularly useful for contactless smart cards as no contacts are required with the surface layer. Consequently, the substrate/component layer can be manufactured with the reinforcement in place as the position of the substrate between the skins 8 is not critical as it is in a contact-type card where surface contacts are required.

The card as a whole is likely to be subject to considerable deformation in use. The combination of the labels on opposing faces serves to preserve the integrity of the structure and significantly reduces the likelihood of the reinforced regions around the or each component 'breaking out' of the structure.

Changes can be made while remaining within the scope of the invention.

CLAIMS

1. A portable electronic token comprising a plurality of discrete components encapsulated in a plastics material and at least one respective high tensile member associated with each component and disposed such that a region of the token encompassing the component is substantially constrained from flexing, the components being mounted on a flexible substrate which extends between the components so as to form resilient hinge portions between adjacent components.

2. A token as claimed in claim 1 which comprises a pair of face members defining opposite surfaces of the token, the flexible substrate being disposed therebetween.

3. A token as claimed in claim 2 wherein the face members are of polycarbonate or polyester.

4. A token as claimed in Claim 1, 2 or 3 wherein tensile members are associated with each component, in respective dispositions above and below the component and substrate.

5. A token as claimed in Claim 4 wherein one of the

tensile members associated with each component is integral with the substrate.

6. A token as claimed in claim 1, wherein a tensile member substantially encircles each component.

7. A token as claimed in claim 6 wherein the tensile member is a circular or polygonal plate having an aperture therein.

8. A token as claimed in any of the preceding claims wherein each component is encapsulated in a hard glob top resin material.

9. A token as claimed in any of the preceding claims wherein the tensile members are metal foils.

10. A token as claimed in claim 9 wherein the foils are of nickel, stainless steel or high tensile steel.

11. A token as claimed in claim 1, wherein the tensile member is formed from a hard moulded resin.

12. A token as claimed in claim 11, wherein the resin is moulded directly onto the substrate.

13. A token as claimed in claim 11 or 12, wherein the resin is a glob top resin.

14. A token as claimed in any preceding claim and including processing means, memory means, and inductive input/output means, for interacting with an external read/write unit to transmit and receive data.

15. A token as claimed in claim 7 of dimensions substantially 8.5 x 5.4 x 0.075 cm and having an overall flexible nature.

16. A token as claimed in claim 3 wherein the face members act as labels.

17. A token as claimed in claim 16 wherein the graphic image of the label is on the inner surface of the face members.

18. A flexible token substantially as hereinbefore described with reference to, and as illustrated by, the accompanying drawings.

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